**What is claimed is:**

1. A recombinant plasmid pZQ12, wherein a *cimA* gene is inserted into NcoI and BamHI multiple cloning sites of a plasmid pACYCDuet-1; a *leuBCD* gene is inserted into BamHI and SacI multiple cloning sites of the plasmid pACYCDuet-1; an *ilvA* gene is inserted into SacI and AscI multiple cloning sites of the plasmid pACYCDuet-1; and a *thrA*BC* gene is inserted into the AscI multiple cloning site of the plasmid pACYCDuet-1;

the *cimA* gene has a nucleotide sequence represented by SEQ ID No. 1 in the sequence table;

the *leuBCD* gene has a nucleotide sequence represented by SEQ ID No. 2 in the sequence table;

the *ilvA* gene has a nucleotide sequence represented by SEQ ID No. 3 in the sequence table.

*the thrA*BC* gene has a nucleotide sequence represented by SEQ ID No. 4 in the sequence table.

2. A preparation method for the recombinant plasmid pZQ12 according to claim 1, comprising the following steps:

1) performing double enzyme digestion on the plasmid pACYCDuet-1 and the *cimA* gene by using NcoI and BamHI respectively, to obtain enzyme-digested pACYCDuet-1 and *cimA* gene;

2) ligating the enzyme-digested pACYCDuet-1 and *cimA* gene of step 1) to obtain *recombinant* plasmid pACYCDuet-1-cimA;

3) performing double enzyme digestion on the recombinant plasmid pACYCDuet-1-cimA of step 2) and the *leuBCD* gene by using BamHI and SacI respectively, to obtain enzyme-digested pACYCDuet-1-cimA and *leuBCD* gene;

4) ligating the enzyme-digested pACYCDuet-1-cimA and *leuBCD* gene of step 3) to obtain recombinant plasmid pACYCDuet-1-cimA-leuBCD;

5) performing double enzyme digestion on the recombinant plasmid pACYCDuet-1-cimA-leuBCD of step 4) and the *ilvA* gene by using SacI and AscI respectively, to obtain enzyme-digested pACYCDuet-1-cimA-leuBCD and *ilvA* gene;

6) ligating the enzyme-digested pACYCDuet-1-cimA-leuBCD and *ilvA* gene of step 5) to obtain recombinant plasmid pACYCDuet-1-cimA-leuBCD-ilvA;

7) performing single enzyme digestion on the recombinant plasmid pACYCDuet-1-cimA-leuBCD-ilvA of step 6) and the *thrA*BC* gene by using AscI respectively,

to obtain enzyme-digested pACYCDuet-1-cimA-leuBCD-ilvA and *thrA*BC* gene; and

8) ligating the enzyme-digested pACYCDuet-1-cimA-leuBCD-ilvA and *thrA*BC* gene of step 7) to obtain the recombinant plasmid pZQ12.

3. The preparation method according to claim 2, wherein the preparation method for the *cimA* gene in step 1) comprises the following steps:

a. extracting total DNA of *Methanobacterium sp.* MB1; and

b. by using the total DNA of step a as a template, amplifying the *cimA* gene with primers cimA-F and cimA-R to obtain the *cimA* gene; wherein

the primer cimA-F has a nucleotide sequence represented by SEQ ID No. 5 in the sequence table; and

the primer cimA-R has a nucleotide sequence represented by SEQ ID No. 6 in the sequence table.

4. The preparation method according to claim 2, wherein the preparation method for the *leuBCD* gene in step 3) comprises the following steps:

(1) extracting total DNA of *Escherichia coli* MG1655; and

(2) by using the total DNA of step (1) as a template, amplifying the *leuBCD* gene with primers leuBCD-F and leuBCD-R to obtain the *leuBCD* gene; wherein

the primer leuBCD-F has a nucleotide sequence represented by SEQ ID No. 7 in the sequence table; and

the primer leuBCD-R has a nucleotide sequence represented by SEQ ID No. 8 in the sequence table.

5. The preparation method according to claim 2, wherein the preparation method for the *ilvA* gene in step 5) comprises the following steps:

[1] extracting total DNA of *Pseudomonas fluorescens* PICF7; and

[2] by using the total DNA of step [1] as a template, amplifying the *ilvA* gene with primers ilvA-F and ilvA-R to obtain the *ilvA* gene; wherein

the primer ilvA-F has a nucleotide sequence represented by SEQ ID No. 9 in the sequence table; and

the primer ilvA-R has a nucleotide sequence represented by SEQ ID No. 10 in the sequence table.

6. The preparation method according to any one of claims 3-5, wherein amplification procedures for the amplification in steps b, (2), and [2] are independently: pre-denaturation: 94°C, 5 min, 1 cycle; denaturation: 94°C, 45 s; annealing: 55-60°C, 45 s; extension: 72°C, 2 min, wherein the denaturation, annealing, and extension all experience 30 cycles; and final

extension: 72°C, 10 min.

7. The preparation method according to claim 2, wherein the preparation method for the *thrA*BC* gene in step 7) comprises the following steps:

(S1) extracting total DNA of *Escherichia coli* MDS42; and

(S2) by using the total DNA of step S1 as a template, performing amplification with primers thrA-F1/thrA-R1 and thrA-F2/thrA-R2 respectively to obtain two fragments;

(S3) after mixing the two fragments obtained in step S2, by using the obtained mixed fragment as a template, performing amplification with primers thrA-F1 and thrA-R2 to obtain a *thrA** gene subjected to site-directed mutagenesis;

(S4) by using the total DNA of step S1 as a template, performing amplification with a primer thrBC-F/thrBC-R to obtain a *thrBC* gene; and

(S5) by using the *thrA** gene of step S3 and the *thrBC* gene of step S4 as templates, performing amplification with a primer thrA*BC-F/thrA*BC-R to obtain the *thrA*BC* gene; wherein

the primer thrA-F1 has a nucleotide sequence represented by SEQ ID No. 11 in the sequence table;

the primer thrA-R1 has a nucleotide sequence represented by SEQ ID No. 12 in the sequence table;

the primer thrA-F2 has a nucleotide sequence represented by SEQ ID No. 13 in the sequence table;

the primer thrA-R2 has a nucleotide sequence represented by SEQ ID No. 14 in the sequence table;

the primer thrBC-F has a nucleotide sequence represented by SEQ ID No. 15 in the sequence table;

the primer thrBC-R has a nucleotide sequence represented by SEQ ID No. 16 in the sequence table;

the primer thrA*BC-F has a nucleotide sequence represented by SEQ ID No. 17 in the sequence table; and

the primer thrA*BC-R has a nucleotide sequence represented by SEQ ID No. 18 in the sequence table.

8. A recombinant bacterium for synthesizing odd and even carbon chain monomer copolymerized mcl-PHA, wherein the recombinant bacterium is prepared using the following method: transferring the recombinant plasmid pZQ12 according to any one of claims 1-7 and a

recombinant plasmid pQQ05 into *Escherichia coli* LZ09;

the *Escherichia coli* LZ09 is obtained by knocking out acetic acid synthesis genes *ackA* and *poxB*, and a lactate synthesis gene *ldhA* from *Escherichia coli* LZ05.

9. An application of the recombinant bacterium according to claim 8 in the synthesis of odd and even carbon chain monomer copolymerized mcl-PHA.